# Highland Lake Conservation Project

1999-2002

Working to improve and protect the water quality of Highland Lake

***Thank you to the sponsors of this project:***

Maine Department of Environmental Protection
Municipalities of Windham, Falmouth and Westbrook

***Thank you those who provided in-kind support for the project:***

Highland Lake Association
Town of Windham Public Works
Town of Falmouth Public Works
O'Donal's Nursery
Pierson Nursery

***Cumberland County Soil & Water Conservation District staff support for this project:***

Tamara Lee Pinard, Lakes Program Manager
Betty Williams, Project Manager
Jeff Edelstein, District Engineer
Betty McInnes, District Manager

# Project Purpose

The purpose of this project was to improve or maintain stable water quality and reduce symptoms of eutrophication in Highland Lake. This was accomplished by reducing the amount of phosphorus entering the lake, continuing water quality monitoring and promoting watershed stewardship.

## Lake and Watershed Description

Highland Lake is a 623-acre lake located in eastern Cumberland County in Southern Maine. The lake's watershed covers approximately 8.5 square miles in Falmouth, Windham and Westbrook (Figure 1).

Several perennial and intermittent streams drain into the lake from its surrounding watershed. The lake's sole outlet stream begins at the Highland Lake Dam as the headwaters of Mill Brook. Mill Brook, in turn, is a major tributary of the Presumpscot River, which ultimately flows into Casco Bay.

Highland Lake is highly valued by the area's seasonal and year-round residents for its seemingly pristine waters and sense of wilderness that it offers while still providing the conveniences of nearby Portland. It is a popular lake for winter activities such as snowmobiling and ice fishing and summer activities such as boating, kayaking and canoeing. The lake's public boat launch also makes it an accessible and popular destination for visitors from outside the watershed.

Highland Lake, previously known as Duck Pond, covers 623 acres (nearly one square mile) and has a total volume of 14,000-acre feet (Table 1). It has a maximum depth of 67 feet, an average depth of 22 feet and a flushing rate of 0.7 flushes/year. The lake is dimictic; that is, it is deep enough to "turn over" twice per year.

The lake has about eight miles of shoreline, most of which is privately owned. There is a public launch located on Lowell Farm Road at the south end of the lake in the Town of Falmouth. The launch provides carry-in access for canoes and kayaks.

# Water Quality in Highland Lake

Highland Lake has experienced a gradual decline in water quality over the past several years. The average annual secchi disk reading (a measure of water clarity) over the past decade is about one meter (three feet) less than it was in the previous decade, which signals an increase in algae and sediment in the lake. In addition, the average dissolved oxygen in the lake's bottom layer during September (when it is expected to be the lowest) has dropped to levels that threaten the lake's trout fishery.

Both problems can be attributed to polluted runoff, or nonpoint source pollution (NPS), that washes into the lake from its surrounding watershed. Phosphorus, which attaches to soil particles, poses the greatest NPS threat to Highland Lake. Phosphorus spurs excess algae growth, causing declines in water clarity and oxygen levels. Ultimately, high inputs of phosphorus can lead to a degradation of fish habitat, development of nuisance algae blooms and losses in lakefront property values.

# Monitoring Program

HLA volunteers implemented a comprehensive water quality monitoring program that surpassed efforts typically undertaken through the MDEP's Volunteer Lake Monitoring Program. Volunteers collected secchi disk, temperature, total phosphorus, chlorophyll a and dissolved oxygen measurement. The volunteers also surveyed periphyton and aquatic macrophyte populations on a yearly basis.

HLA expanded their lake and stream baseline monitoring through participation in the Lake Lay Monitoring Program, which was coordinated by the Freshwater Biology Group at the University of New Hampshire. The secchi disk testing done for the 2001 and 2002 season has shown improvement in water clarity. Water Quality Monitoring will continue on a bi-weekly basis during the summer months and on a monthly basis during the winter months.

*The Maine Department of Environmental Protection (MDEP) has recognized Highland Lake's downward trend in water clarity. According to the 2000 State of Maine Water Quality Assessment, Highland Lake does not meet the state's water quality standards (MDEP, 2000). The MDEP has also placed Highland Lake on the state's "Priority Watersheds" list and list of lakes "Most at Risk from Development."*

# Conservation Project Team

- **Cumberland County Soil & Water Conservation District**
- **Highland Lake Association**
- **Municipalities of Windham, Falmouth and Westbrook**
- **Highland Lake Watershed Community**
- **Maine Department of Environmental Protection**

# Conservation Project Timeline

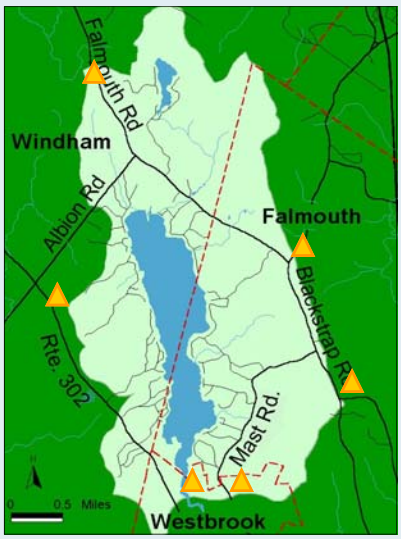
| | |
|---|---|
| **1997** | **Watershed Survey** |
| **1998** | **Watershed Management Plan** |
| **1998** | **Implementation Grant**<br>***$206,975 received through Priority Watershed Protection Grants Program*** |
| **1999-2002** | **Conservation Project began June 1999 and ended in January 2003** |

# What was our goal?

**Improve and protect the water quality of Highland Lake**

# How did we meet our goal?

- **Through Education**
- **Through Technical Assistance**
- **Through On-the-ground fixes**


## Education

Watershed signs were installed at six locations to inform the public about the Highland Lake watershed boundaries

# Education

## Project Goal:

- Hold three educational workshops
- Install watershed signs
- Create & distribute outreach materials for watershed residents

## Project Accomplishments:

- One - traditional, plant a buffer workshop (Sunset Rd, Falmouth)
- Three - Cruising the Buffers, "seeing is believing," workshops
- Three Road Workshops (Anthoine & Candlewyck Roads, Windham, and Rock-a-way Rd in Falmouth)
- Watershed signs installed at six locations to inform the public about the watershed boundaries
- Two Highland Lake Festival "Weeks", which included
  - Fun, educational activities for kids
  - Informational displays
  - Buffer Tours on the Lake
- Over twenty published articles in Suburban News, Portland Press Herald, American Journal, Falmouth Shopping Notes & the HLA Newsletter
- Welcome Guide to Highland Lake—a resource manual of everything watershed residents need to know about lake living

Education

Young and old, alike, participated in a buffer workshop on Sunset Road in Falmouth. More than 15 people were involved with the planting of 30 shrubs and trees.

# Technical Assistance

**Project Goal:**

- Carry out 30 technical assistance visits

**Project Accomplishments:**

- 147 technical assistance visits completed
  Properties were assessed and site conditions and specific recommendations were summarized in reports

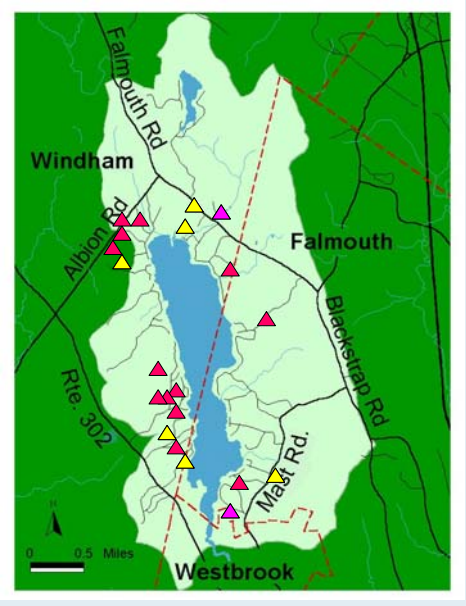
# On-the-ground fixes

**Project Goal:**

- 15 Road Sites

**Project Accomplishments:**

- 22 road sites completed




## On-the-ground fixes

Anthoine Road, Birdsong Lane, Candlewyck Road, Cove Road, Crest Haven, Falmouth Road, Gravel Hill Road, Haven Road, Hide-a-way Road, Highland Shore Road, Upper Beach, Lantern Lane, Lowell Farm Road (State Boat Launch), Lower Beach, Mast Road, Overlook Road, Pilgrim Lane, Pond Villa Road, Rock-a-way Road, Swan Road, Sunset Road, Vista Drive

# On-the-ground fixes—Road Projects

All totaled, twenty-two road projects were completed. Of special note are the six road sites that would not have been possible without the generous contribution of time on the part of volunteers: Candlewyck Road, Gravel Hill Road, Hide-a-way Lane, Lower Beach Road, Upper Beach Road and Rock-a-way Road.

For both Falmouth Road and the State Boat Launch on Lowell Farm Road, the grant supplied the engineering, and state agencies (MDOT & DOC, respectively) supplied the labor and financing to complete the job.

Mast Road in Falmouth was completed through the efforts of the Falmouth Public Works Department.


## Road Projects

**Swan Road** — This was a notoriously steep and eroding road that used to deposit approximately 2.5 tons of sediment (21 lbs of phosphorus) annually into Highland Lake. Pictured here is the last line of defense—a settling basin to trap sediment before it reaches Highland Lake.

The entire Swan Road project consisted of the installation and construction of two large settling basins; placing, crowning and rolling of 80 cubic yards of reclaim asphalt on approximately 200' of road; 100' of ditching; and installation of one, 12" cross culvert.

# On-the-ground fixes—Road Projects

**Sunset Road** — This road used to deposit approximately 1.25 tons of sediment (10 lbs of phosphorus) annually into Highland Lake. Pictured at left is 115' of installed and stabilized ditching that picks up the runoff from this entire corner, transmits it to a revamped manhole and newly replaced culvert and, ultimately, sends it to a settling basin before it enters Highland Lake.


**Cove Road** — This is an extremely steep road that became a virtual "river of mud" each spring, dumping approximately 3.5 tons of sediment (30 lbs of phosphorus) annually into Highland Lake.

The large gully is apparent in the before picture, and Highland Lake is situated at the base of this hill! Diversions were installed at the top of the hill to send water into a vegetated area. In addition, the 320' of road was resurfaced, crowned and rolled and a series of rubber razor blades were installed to serve as additional water diverters.

# Youth Conservation Corps

## Highland Lake Crew




### Project Goal:

- Complete 30 sites

### Project Accomplishments:

- 88 sites completed
- Program set up to be sustainable through continued support from Windham, Falmouth and the Highland Lake Association

***The Highland Lake Youth Conservation Corps,*** a group of five high school students, a crew leader, and a director, was established to install conservation practices, by hand, that reduce polluted stormwater runoff from the watershed.

A YCC Steering Committee was formed, and the China and Belgrade Lakes YCC programs were used as a framework to guide the formation of Highland's entire YCC program.

At each site, the property owner is responsible for purchasing the materials, while the labor was provided through the grant. Projects included roadside ditching, water bars, diversions, seeding and mulching, bank stabilization (with rip rap or vegetation), riparian plantings, cleaning out culverts, removing winter sand, and installing erosion control measures.

## YCC Benefits

- Necessary, routine maintenance of conservation practices such as ditches, settling basins and culverts is completed annually
- Free labor and technical assistance for landowners
- Education of the community, and the crew, itself
- Improved water quality of Highland Lake

# And the future?

**Lake protection never reaches an endpoint. It requires a continual process of education and routine maintenance.**

**The Highland Lake Association will continue to take the lead in efforts to protect the lake by:**

- Publishing a bi-annual newsletter
- Monitoring the water quality of Highland Lake
- Distributing the informative Lake Living Guide to new watershed residents
- Sustaining the efforts of the Youth Conservation Corps in cooperation with the municipalities of Windham and Falmouth
- Partnering with the Cumberland County Soil and Water Conservation District on future grants to implement more on-the-ground fixes, and spearhead educational efforts promoting the values of increased vegetation, and routine road and septic system maintenance.

# Thank you